

## **HYPP: A Genetic Disease**

*By Tracy Williams*

The madness began with a single horse. His name was Impressive, and he lived up to his name not only in appearance and show ring success but also by introducing an acronym that would shake the Quarter Horse industry to its core: HYPP. Impressive exploded on the halter horse scene with pizzazz, and it wasn't long before his excellent conformation and near perfect musculature gave him the show record needed to launch him into stud success. Impressive passed along these stellar traits to his offspring, many of whom became strong influences in their own right in the breeding world. Thus, his genes spread quickly until owners began noticing strange muscle tremors in some of his many offspring. Along with his brilliance, Impressive had inadvertently passed along a genetic mutation that due to his popularity seemed to be everywhere.

### **It's All in the Genes**

Hyperkalemic Periodic Paralysis, more commonly known as HYPP, is strictly a genetic disease, meaning that it is not contagious and is only transmitted from parent to offspring. Unfortunately, it is a dominant trait; a horse needs only to carry one copy of the dominant allele to be affected and to pass the disease to its offspring. A horse that carries two copies of the dominant gene will pass the disease to its offspring 100 percent of the time, regardless of whether or not the other member of the breeding pair has the defective gene. Breeding a horse that carries only one copy of the mutation (heterozygous for the trait) to a horse that is free from the disease gives the breeder a 50/50 shot at having an HYPP foal. Breeding two heterozygous horses gives you only a 25 percent chance at having a healthy foal.

The disease began as a simple mutation, a normal step in the evolutionary process. This particular mutation causes a disruption in a muscle protein called a sodium ion channel. In a normal horse, the sodium ion channel opens and closes to allow sodium and potassium in and out of muscle cells, a process that is vital for the electrical activity responsible for muscle contraction and relaxation. In a horse affected by HYPP, the sodium ion channel malfunctions, allowing large influxes of sodium into the cell during an episode. This skews the sodium/potassium balance which in turn alters the voltage current in the cell causing uncontrollable muscle twitching, tremors and paralysis. Thus, high blood levels of potassium are usually present during an episode and can help pinpoint HYPP as the cause.

### **A Symptom Spectrum**

Horses can exhibit a wide range of severity in their symptoms. Some affected horses appear clinically normal and have successful show careers, while others need daily medication to control attacks. A horse that carries two copies of the mutation seems to have more violent episodes, and these horses with severe symptoms also have numerous sodium channel mutations in their skeletal muscle. It is a muscle disease, so an episode can consist of weakness, tremors, paralysis, respiratory noises (from paralysis of airway muscles) and even collapse. In severe cases, horses can die from respiratory failure or cardiac arrest. These episodes tend to be unpredictable and can last anywhere from minutes to hours depending on the particular case.

While one can't technically predict an attack, HYPP episodes do seem to have ties to certain environmental changes. Stress, diet changes, anesthesia, fasting, exercise restriction and illness all can cause an HYPP episode. Thus, management plays an important role in symptom severity and can help control the illness. While horses affected with HYPP never outgrow the disease, with proper management, over time frequency and severity of episodes seem to abate.

### **Management and Prevention**

### ***Get a Diagnosis***

The first step in managing HYPP is properly diagnosing the disease to make sure your horse doesn't suffer from a different illness. A genetic test is available through the American Quarter Horse Association, and the association recommends that all descendants of Impressive be tested. All HYPP horses to date can trace their ancestry to Impressive.

### ***Maintain a Schedule***

Once you have confirmed your horse does indeed have HYPP, start by developing a diet and exercise schedule you can adhere to consistently. Feed at the same times daily, and avoid periods of fasting or water deprivation. If possible, allow for regular exercise, such as daily (or better yet – constant) turnout, which seems to diminish symptoms.

### ***Feed with Care***

High levels of dietary potassium can cause an HYPP episode, so it becomes part of your job to restrict dietary intake of the mineral. Unfortunately, many common horse feeds contain high levels of potassium - alfalfa hay and molasses (found in most sweet feeds) are two examples. To dodge high-potassium feeds yet still provide adequate nutrition, consult with an equine nutritionist or veterinarian to formulate a specific diet for your horse. This is especially important if you are dealing with a horse that has extra nutritional requirements such as an aging or young and growing horse. For a horse without special energy needs, you can generally stick to grass hay, pasture or alfalfa/grass mixtures to form the basis of your horse's diet. In any case, be sure to provide access to plenty of water and free-choice salt – both of which help horses expel excess potassium from their systems.

### ***If Needed - Medicate***

If your current management strategies aren't enough, a veterinarian may prescribe medication such as acetazolamide to control episodes.

### **Treating an Attack**

If your horse has been properly diagnosed with HYPP and experiences a mild episode, there are steps you can take as an owner to alleviate the attack. Exercise such as walking and/or lunging stimulates adrenaline, which helps replace potassium inside cells balancing out the sodium influx. Feeding small amounts of grain can also help because the carbohydrates will release insulin, which also encourages potassium uptake into cells. If symptoms are severe, contact a qualified veterinarian for treatment.

Although Impressive's popularity has made HYPP a definite presence in the Quarter World, there are silver linings. HYPP is a manageable disease, and while it cannot be cured, with proper care, HYPP horses can live long and productive lives. In addition, although it is a dominant genetic trait, because it can be tested for, with careful breeding practices, eventually HYPP can be eradicated from the Quarter Horse's memory.

### **Sidebar 1: The American Quarter Horse**

Fortunately HYPP is not the only trait for which the American Quarter Horse is known. Although it originally received its name from an ability to outclass other horses at short-distance races (quarter mile or less), it has gradually gained a reputation as one of the most versatile breeds, able to excel at a wide spectrum of disciplines from halter to reining to cutting to racing to beyond even these borders.

The breed traces its roots to America's beginning. During Colonial times, settlers crossed imported English Thoroughbred with "native horses" – Spanish stock confiscated by Native Americans over time. The result was a unique cross that rapidly gained popularity over short flat racing distances, giving them the nickname "Quarter Miler". As Americans spread West, pioneers were introduced to more branches of Spanish stock – wild mustangs and other groups domesticated by Native American tribes. When East

Coast Quarter Milers were crossed with these hardy Westerners, the result became the ranch horse that opened up the West. Big working cattle ranches such as the King Ranch, the 6666 Ranch and the Waggoner Ranch helped develop the modern Quarter Horse, and the ranch horse skills initially coveted for survival only became the basis of today's rodeo. Concurrently, however, demand for sprint racers did not diminish, and Thoroughbred blood was added to produce this blend of speed and short distance power, another facet of the Quarter Horse's greatness.

In 1940, a group of horsemen and ranchers formed the American Quarter Horse Association to preserve the pedigrees of these ranch horses. From the first registration number, Wimpy (descendant of the King Ranch foundation sire, Old Sorrel), the association has grown to one of the largest registries in the world.

The modern Quarter Horse is defined by having a small and refined head and a strong, well-muscled body with a broad chest and powerful hindquarters. Depending on the discipline it is bred for, Quarter Horses can stray into a taller, sleeker racing form, the more heavily muscled halter conformation, or the short, quick and agile cutter. Its versatility is its hallmark trait.

Tracy Williams is a freelance writer whose Quarter Horse race mare, Sheza Snow Jewel, is expecting her first foal in March.